

## Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.



## x LIST OF PUBLICATIONS WITH ABSTRACTS, y.

Fruit and Vegetable Chemistry Laboratory,  
263 South Chester Avenue, Pasadena 5, Calif.  
January, 1940 - June, 1951 x

Publications with AIC preceding their numbers are mimeographed, and supplies are maintained for free distribution. A limited number of reprints of journal articles are available, usually for a short period following publication. The asterisk (\*) before a title indicates that no reprints of that publication are available. Photostat copies can be purchased at nominal cost through the Library of the United States Department of Agriculture, Washington 25, D. C.



Bureau of Agricultural and Industrial Chemistry  
Agricultural Research Administration  
UNITED STATES DEPARTMENT OF AGRICULTURE



1940

- \* PRESERVATION OF FRUITS AND VEGETABLES BY FREEZING. D. G. Sorber. Improving Utah Canning Crops, Proc. 4th Annual School for Canning Crop Growers and Cannerymen, Jan. 5-6, 1940, Logan, Utah. Discusses the preservation of fruits and vegetables by freezing, with major emphasis on vegetables, and particularly on means of securing vegetables of high quality best suited to Utah growing conditions. Only brief mention is made of actual preparation, freezing, packaging, and storing.
- \* PRESERVING THE DIETETIC VALUE OF FROZEN FOODS. E. M. Chase, Jour. Amer. Dietetic Assoc. 16(1):34-38, Jan., 1940. A short discussion of increased production of frozen fruits and vegetables dealing with certain problems influencing quality of products. Storage, distribution, and marketing problems are also discussed. The freezing of fruits and fruit juices is briefly described.
- \* DETERMINATION OF AIR IN CITRUS JUICES. H. J. Loeffler, Indus. and Engin. Chem., Analyt. Ed. 12(9):533-4, Sept., 1940. An apparatus for determining air in citrus juices was developed and described. It consists of a mercury-filled evacuation chamber (fitted with a drain to a leveling bulb), 2 three-way capillary mercury seal stopcocks, and a microburette connected with the leveling bulb. Detailed instructions are given for using the apparatus and a discussion of the method is given to clarify points which might be in doubt. A table is included showing results of one, two, and three passages through the deaerator.

1941

- \* PROCESSING OF ORANGE JUICE. EFFECT OF STORAGE TEMPERATURE ON QUALITY FACTORS OF BOTTLED JUICES. H. J. Loeffler, Indus. and Engin. Chem. 33(10):1308-14, Oct., 1941. High-temperature pasteurization is recommended to retain the "cloud" in orange juice, followed by rapid cooling to avoid cooked flavors. Quantitative methods employing a photoelectric colorimeter were devised for measuring changes in vitamin C, cloud, color, and amino nitrogen content in pasteurized orange juice.
- \* MAINTENANCE OF CLOUD IN CITRUS JUICES. H. J. Loeffler, Proc. Inst. Food Tech. pp. 29-36, 1941. A comparative study of the quantitative "cloud index" values, determined with a photoelectric colorimeter on experimental packs of citrus juices in glass containers, shows that the cloud is actually increased by flash pasteurization and not merely stabilized. The enzymic changes occur so rapidly after reaming of the fruit that at least a partial enzymic coagulation of the cloud will occur before the juice can be screened, deaerated and heated to a pasteurization temperature. The loss of cloud during storage after processing is not due entirely to pectic enzymes, since heavily clouded samples pasteurized at comparatively high temperatures will lose an appreciable portion of their cloud. Homogenization before pasteurization not only increases the cloud, but forms a stable suspension of the pigmented material in the supernatant liquid.

1942

CITRUS FRUIT PRODUCTS. E. M. Chace, H. W. von Loesecke, and J. L. Heid, U. S. Dept. Agr. Circular 577, 1940, revised 1942. A brief review of the status of the citrus-products industry up to 1942 is given, together with a statement of the composition of common citrus fruits, and a description in some detail of commercial methods of preparation of citrus products. Methods of canning juice and segments, for producing beverage material, wines and brandies, vinegar, pectin, marmalade and marmalade stock, jellies, candied peel and essential oils are given. There is also a brief statement on the disposal of citrus wastes.

\*THE PRESENT STATUS OF FOOD DEHYDRATION IN THE UNITED STATES. E. M. Chace, Proc. Inst. Food Tech. pp. 70-89, 1942. A general review on the subject of dehydration, including results of research work carried out on the dehydration of vegetables. Numerous graphs and tables of results are given.

PRESERVATION OF FRUITS AND VEGETABLES BY COMMERCIAL DEHYDRATION. E. M. Chace, W. A. Noel, and V. A. Pease, U.S. Dept. Agr. Circular 619, Sept., 1941, revised 1942. This circular reports an investigation to determine certain physical principles and their application to dehydration problems, including engineering calculations for design of tunnel driers. Details of preparation, dehydration, yield, and keeping qualities of individual fruits and vegetables are given in the text and summarized in a table. A long list of U.S. patents and references on dehydration is included.

QUANTITATIVE FIELD TEST FOR ESTIMATION OF PEROXIDASE. W. B. Davis, Indus. and Engin. Chem., Analyt. Ed. 14(12):952-3, 1942. A quantitative peroxidase test for securing a graded measurement of heat effect on steam-blanching vegetables is described. This test is more satisfactory than simple enzyme color tests. Under proper conditions, the test can be used for factory control to show when proper blanching is obtained. The basis for the determination of peroxidase values used in the test is a chemical reaction accelerated by peroxidase, in which the endpoint is a flash of blue color. The test can be used in the presence of naturally occurring coloring matter.

\*EXTRACTION OF ASCORBIC ACID FROM PLANT TISSUES. W. B. Davis, Indus. and Engin. Chem. 34(2):217-218, Feb., 1942. A new method of extracting ascorbic acid from plant tissue by the use of a blender type of disintegrator is compared with the usual method of grinding by hand in a mortar. The new method is just as efficient as the more laborious method and more convenient. A clear extract, important for getting a good endpoint by titration methods, was secured without loss of ascorbic acid by use of filter aid.

\*DISTRIBUTION AND PREPARATION OF CITRUS PEROXIDASE. W. B. Davis, Amer. Jour. Botany 29(3):252-4, March, 1942. The distribution of peroxidase as determined by a quantitative method is given for certain tissues of the Navel orange, lemon, tangerine, and more completely for the Marsh grapefruit. The outermost layer of the peel of grapefruit contained the greatest quantity of peroxidase found in the fruit tissues. The inner seed coat of tangerine and grapefruit seeds contained the highest quantity of peroxidase found in different parts of the seeds.

PROTEIN AND SULFUR CONTENTS OF IMMATURE LIMA BEANS (Phaseolus lunatus) AS AFFECTED BY VARIETAL AND ENVIRONMENTAL FACTORS AND PROCESSING. M. E. Davis, E. M. Chace, and C. G. Church, Food Res. 7(1):26-37, 1942. The variations in protein and sulphur contents of green lima beans, such as are preserved for food use by freezing, grown under normal conditions in Central and Southern California, were found to be determined by environment rather than by heredity. The significant variations found in fresh beans of different morphological types were related to water content. Removal of white, immature beans from the samples, or blanching, freezing, or drying procedures in processing only slightly affected the nitrogen and sulphur fractions of the total solids.

THE CIRCULAR REVOLVING BRUSH AS A TISSUE DISINTEGRATOR. W. B. Davis, Plant Physiol. 17(1):145-146, 1942. The adaptation of a circular high-speed revolving brush made of palmyra fibers or stainless steel is described as a companion tool to the widely used blender type of disintegrator (Davis, W. B., "A Substitute for the Laboratory Food Grinder," Indus. and Engin. Chem., News Ed. 17:752, 1939) in the quick, convenient preparation of plant tissues for extraction or analysis.

FOOD DEHYDRATION--A REVIVED INDUSTRY. E. A. Beavens, Rural New Yorker 102 (5547):34, Jan. 23, 1943. General article on food dehydration giving a few highlights of the historical background, status of the dehydration industry during and after World War I, research carried on during World War II, and a quick look into the future of the industry.

ADVANCES IN METHODS OF FOOD DEHYDRATION. E. A. Beavens, Rural New Yorker 102 (5552):202, 218, Apr. 3, 1943. Briefly describes advances made in vegetable dehydration after start of World War II. Information is given on vegetable varieties best suited for dehydration, effects of geographical location on varietal differences, harvesting, processing, dehydration methods, and packaging practices.

1944

CABINET DEHYDRATORS SUITED TO SMALL-SCALE OPERATIONS. E. A. Beavens, Food Indus. 16(1):70-72; (2):90-92; (3):75, Jan., Feb., March, 1944. Illustrates six types of cabinet dehydrators of various capacities, with descriptions of their construction and capacities. A short discussion of preparation equipment is followed by more elaborate sections on operating procedures and determination of optimum dehydrating temperatures. Examples are given to illustrate these points and a table of suggested wet-and-dry-bulb temperatures for a number of vegetables is shown. Finishing and packaging of the dehydrated vegetables is discussed. Part III discusses best application of the different types of dehydrators, with special attention to multi-stage dehydrators, combination compartment-and-tunnel systems and duplex cabinet systems.

1945

COMMERCIAL SULPHITING PRACTICES. E. A. Beavens and J. A. Bourne, Food Indus. 17 (9):1044-1045, 1945. Describes how dehydration plants automatically treat carrots and cabbage on trays with sulphite solutions before or after dehydration to retain flavor, color, and vitamin content. Process and equipment are described and illustrated in a flow diagram.

1947

DETERMINATION OF FLAVANONES IN CITRUS FRUITS. W. B. Davis, *Analyt. Chem.* 19(7): 476-478, 1947. Describes a new colorimetric method using alkaline diethylene glycol for determination of the bitter rhamnoglycoside naringin and other flavanones that may be present in grapefruit in particular, as well as in other citrus fruits. Although not specific for naringin, it is a rapid procedure of practical value, which is particularly applicable to the assay of naringin in juice and colored flavedo of grapefruit, and of hesperidin in other citrus fruits. The possibility of other substances interfering with the method is discussed.

RAPID DISSOLVED OXYGEN TEST FOR FRESH CITRUS JUICES. J. R. Lindquist, *Food Indus.* 19(2):182-3, 1947. A rapid, polarographic method for estimating dissolved oxygen in citrus juices is outlined. The construction of a simple inexpensive polarograph is also described. Fundamentally the method measures resulting current when oxygen is reduced at the polarized dropping mercury electrode at a potential above the decomposition potential of oxygen. Magnitude of the current is proportional to amount of oxygen present when other conditions are held constant. Polarographic readings are reported as percent saturation by use of a standard curve.

1948

A METHOD FOR MEASURING THE CONSISTENCY OF TOMATO PASTE. J. C. Underwood and G. J. Keller, *Fruit Prod. Jour. and Amer. Food Mfr.* 28(4):103-5, Dec., 1948. A method for measuring consistency of tomato paste has been developed employing a "Penetrometer". This instrument measures penetration of a plastic cone into the material tested, as produced by a given force applied over a given area for a measured length of time at a specified temperature. Penetration cones and plunger rods of different weights and shapes are furnished with the instrument to cover a wide range of consistencies. The method is sensitive and will give reproducible results when following a specified procedure. Factors found to affect the measurements are size of sample container, time of penetration, precision of the instrument and temperature of the measured paste.

1949

ESTIMATION OF THE COLOR OF TOMATO PASTE--APPLICATION OF A COLOR INDEX. W. B. Davis, *Analyt. Chem.* 21(12):1500-1503, 1949. A simple, objective, and quickly prepared color index, obtained by measuring the color of extracts by a photoelectric colorimeter instead of by reflectance measurements, has been applied to tomato juice and to tomato paste prepared in the laboratory and to commercial samples of paste collected from plants in California. The color index method described is not significantly less accurate than existing methods and is more quickly and conveniently applied.

PREPARATION OF LYCOPENE FROM TOMATO PASTE FOR USE AS A SPECTROPHOTOMETRIC STANDARD. W. B. Davis, *Analyt. Chem.* 21(10):1226-1228, 1949. A rapid method for preparation of lycopene for use as a spectrophotometric standard is described. Neither partition in immiscible solvents nor chromatographic columns are used, but instead a simple extraction and crystallization in acetone and one recrystallization in methyl alcohol. No unusual precautions against deterioration were taken, except to work rapidly and avoid strong light. Quantitative absorption curves obtained by the use of lycopene preparation by this method approximate those of Zechmeister and Zscheile.

NEW FROZEN PUREES FROM CITRUS FRUITS. E. A. Beavens, AIC-278, U. S. Dept. Agr., August, 1949. A description of a process for preservation of natural qualities of citrus fruits in the form of frozen purees. Advantages of this method are: production of a new material of high quality and value in food preparation, extension of season for food freezing plants, and utilization of Navel oranges which tend to turn bitter in most other methods of processing. Recipes for pies, cakes, and frozen desserts are included.

A SIMPLIFIED THERMOCOUPLE SEAL. B. W. Nielsen and B. Borson, *The Canner* 109(18): 10-11, Oct. 29, 1949. A short paper describing the construction of a thermocouple seal for measuring internal temperature of products hermetically sealed in tin cans and heated to various temperatures. Advantages of this thermocouple seal are its small size, ruggedness, and ease of attachment to and removal from the container.

\*THE CHEMISTRY OF FRUIT AND VEGETABLE FLAVORS. J. G. Kirchner, *Advances in Food Research*, Vol. 2, pp. 259-290, Academic Press, Inc., New York, 1949. A review of the literature on isolation and identification of flavoring constituents of fruits and vegetables. The various compounds that have been found are listed. Also reviewed are flavoring constituents of the non-alcoholic beverages, tea, coffee, and cocoa. One hundred and sixty-eight references are included.  
1950

THE PRESENCE OF HYDROGEN SULFIDE IN CITRUS JUICES. J. G. Kirchner, R. G. Rice, J. M. Miller, and G. J. Keller, *Arch. Biochem.* 25(1):231-232, Jan., 1950. Free hydrogen sulfide was found in fresh grapefruit and fresh California Valencia orange juice. The amount of hydrogen sulfide varies with season and variety.

CHROMATOGRAPHY ON TREATED FILTER PAPER. J. G. Kirchner and G. J. Keller, *Communication to the Editor, Jour. Amer. Chem. Soc.* 72(4):1867, April, 1950. Filter paper impregnated with various adsorbents broadens the scope of paper chromatography. Separations of compounds not achievable on any of the commercial papers were made possible with paper impregnated with silicic acid. Examples are given. The method can be used as a rapid checking system for solvents for column chromatography.

PRELIMINARY STUDIES ON DEBITTERING NAVEL ORANGE PRODUCTS. R. J. McCulloch. *Calif. Citrograph* 35(7):290, May, 1950. Studies have suggested two possible methods for destroying or removing bitter flavor in processed Navel orange products. One method employs adsorption of the bitter principle and/or its precursor, while the other makes use of enzyme preparations to bring about changes in the bitter principle. Relatively soft carbons of high adsorptive activity were found to be effective in removing not only the bitter compound,

but also its precursor. In the treatment involving use of pectic enzymes, two pectolytic enzyme preparations were employed.

PROCESSING AND PACKAGING OF DATES. I. A NEW METHOD OF CANNING AND PASTEURIZING DEGLET NOOR DATES. B. W. Nielsen, R. J. McCulloch, and E. A. Beavens. Food Technol. 4(5):232-237, June, 1950. Studies have been reported on pasteurization of Deglet Noor dates in hermetically sealed containers such as tin cans or glass jars. It was concluded that darkening of pasteurized dates is primarily an oxidative reaction involving date tannins located just under the skin. Results indicated that dates can be pasteurized without seriously affecting their color if oxygen is excluded from the package. Dates pasteurized in a vacuumized container retained a good color, although the vacuum had a deleterious effect on their texture. Further studies showed that color and texture of dates can be successfully preserved during and after pasteurization by packaging in a vacuumized container with the vacuum released by nitrogen prior to sealing and pasteurizing.

FACTORS INFLUENCING THE QUALITY OF TOMATO PASTE. I. THE CHEMICAL COMPOSITION OF CALIFORNIA COMMERCIAL TOMATO PASTE. J. C. Underwood, Food Research 15(5):366-372, Sept.-Oct. 1950. Variations in California commercial tomato paste are demonstrated by analysis of 17 samples of paste from 12 different plants in Central and Southern California. Values for total solids, insoluble solids, pH, ash, copper, iron, total acidity, salt, total sugars, vitamin C, consistency, color index, lycopene, and carotene are reported. Also discussed briefly are commercial procedures used for producing tomato paste and some of the problems of manufacturing a good-quality paste.

FACTORS INFLUENCING THE QUALITY OF TOMATO PASTE. II. PECTIC CHANGES DURING PROCESSING. R. J. McCulloch, B. W. Nielsen, and E. A. Beavens, Food Technol. 4(9):339-343, Sept., 1950. Studies were made of tomato-paste processing methods in California, with particular reference to preheating temperatures attained in the tomato macerate as related to losses of pectic substances caused by failure to inactivate pectic enzymes. Results demonstrate that failure to inactivate pectic enzymes during paste manufacture may result in a complete loss of pectic substances, which is reflected in lower consistency of finished pastes. At a given level of pectic substances, consistency is also influenced by factors such as content of insoluble solids, alcohol-insoluble solids, and total solids.

NITROGENOUS CONSTITUENTS OF CITRUS FRUIT JUICES. L. B. Rockland, J. C. Underwood, and E. A. Beavens, Calif. Citrograph 35(11):490-492, Sept., 1950. From two to seven free amino acids have been identified in orange, grapefruit, and lemon juices by paper partographic analysis. The literature on nitrogenous constituents in citrus fruit juices is reviewed. The possible importance of nitrogenous constituents in citrus fruit juices is discussed briefly.

#### 1951

SEPARATION AND IDENTIFICATION OF 2,4-DINITROPHENYLHYDRAZONES OF ALDEHYDES AND KETONES, AND 3,5-DINITROBENZATES OF ALCOHOLS BY FILTER PAPER CHROMATOGRAPHY. R. G. Rice, J. G. Kirchner, and G. J. Keller, Analyt. Chem. 23(1):194-195, 1951. A paper chromatographic method has been developed for determining homogeneity and identity of very small samples of 2,4-dinitrophenylhydrazones and

3,5-dinitrobenzoates. The behavior of the 2,4-dinitrophenylhydrazones of 19 carbonyl compounds with three solvent mixtures and three filter papers is described. Similar information is reported for the 3,5-dinitrobenzoate esters of 11 alcohols with five solvent mixtures and four filter papers.

#### SEPARATION AND IDENTIFICATION OF TERPENES BY A NEW CHROMATOGRAPHIC TECHNIQUE.

J. G. Kirchner, J. M. Miller, and G. J. Keller, *Analyt. Chem.* 23(3):420-425, March, 1951. A method has been developed for chromatographing terpenes and some unique tests have been applied to indicate location of colorless compounds. This new technique in organic chromatography has been introduced by using adsorbent coated glass strips in a manner analogous to paper chromatography. Wide choice of adsorbents and spot or band indicating reagents can be employed, and desirable features of column and paper chromatography are combined.

#### A NEW TYPE OF CHROMATOGRAPHIC COLUMN. J. M. Miller and J. G. Kirchner, *Analyt. Chem.* 23(3):428-430, March, 1951.

The chromatobar, a new device for investigations employing chromatography, has been developed. The chromatobar is a rigid column of adsorbent which is not encumbered with a containing glass envelope. Several advantages of this type of column over other types frequently employed are shown. Colorless compounds can be located by direct application of reagents to the sides of the column without necessity of extrusion from a glass tube; indicating reagents can be easily removed from the column; the column can be examined during the course of chromatography and returned for further development; uniform bands are formed, and large columns can be made with little effort.

#### A NEW FROZEN AVOCADO PRODUCT. R. M. McColloch, B. W. Nielsen, and E. A. Beavens, *AIC-305*, April, 1951.

A frozen avocado product with keeping qualities suitable for commercial handling and distribution in frozen food lockers was developed by modifying existing recipes for preparing avocado spread called "guacamole". A convenient container for marketing and use of this frozen product has been found to be collapsible metal tubes, although cans, jars, and waxed fiber cups can be used.

WHAT GIVES FRUIT A FLAVOR? J. G. Kirchner, U.S. Dept. Agr. Yearbook for 1950-1951, Crops in Peace and War, pp. 251-255. This article consists of a general analytical definition of flavors and odors of fruits and a review of researches that have attempted to isolate and identify the compounds that give fruits their flavor. Citrus fruit flavors and odors are discussed at greatest length. Others reviewed are apples, grapes, pineapple, and bananas.

